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U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

REPORT NO 1084

TESTING OF
WARHEADS FOR AIR TARGET GUIDED MISSILES
61st Partial Report

FRAGMENTATION OF SHALLOW-GROOVED
WARHEAD NO 142

FINAL Report

Copy No. 1

Task

Assignment NPg-Re3f-607-1-53

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NPG REPORT NO. 1084

U. S. NAVAL PROVING GROUND
DAHLGREN, VIRGINIA

Sixty-First Partial Report

on

Testing of


Warheads for Air Target Guided Missiles

Final Report

on

Fragmentation of Shallow-Grooved Warhead No. 142

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FRAG NO. 1693

NOL WARHEAD NO 142-1

MP9 NO 524

0-5/8	Gms.	
	PCS	
174	Gms.	
5/8-1 1/4	Gms.	
158	PCS	
139	Gms.	
1 1/4-2 1/2	Gms.	
141	PCS	
257	Gms.	
2 1/2-5	Gms.	
167	PCS	
640	Gms.	
5-10	Gms.	
160	PCS	
1112	Gms.	
10-20	Gms.	
104	PCS	
1477	Gms.	
20-40	Gms.	
46	PCS	
1280	Gms.	
40-80	Gms.	
21	PCS	
1110	Gms.	
80-160	Gms.	
2	PCS	
167	Gms.	
160-320	Gms.	
1	PCS	
215	Gms.	



SCALE 1"

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NFG REPORT NO. 1084

Fragmentation of Shallow-Grooved Warhead No. 142

PART A

SYNOPSIS

1. This test was conducted to determine the ability of shallow coined grooves, 1/16" deep and in a square grid pattern to control fragment size in a warhead model. The warhead used was No. 142, cylindrical, 4-1/8" in diameter, with a 3/8" wall, and Composition C-3 loaded.

2. a. The grid-pattern shallow grooves of Warhead No. 142 were unsatisfactory in controlling fragment size.

b. It is believed that grooves having depths of greater than 50% of wall thickness are needed for controlling fragment size in a warhead of this design.

ADDITIONAL CONGRESS
REFERENCE DEPARTMENT
TECHNICAL INFORMATION DIVISION
FORMERLY
(NAVY RESEARCH SECTION)

2
FEB 17 1953

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NPG REPORT NO. 1084

Fragmentation of Shallow-Grooved Warhead No. 142

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Fragmentation of Shallow-Grooved Warhead No. 142

PART B

INTRODUCTION

1. AUTHORITY:

This test was authorized by reference (a) and conducted under Task Assignment No. NPG-Re3f-607-1-53, reference (b).

2. REFERENCES:

- a. NOL Conf Work Request WG/27/53 of 18 November 1952
- b. BUORD Conf ltr NP9 Re3f:EKJ:gg Ser 42699 of 29 July 1952
- c. NPG Conf Report No. 687 of 20 November 1950

3. BACKGROUND:

a. Reference (b) authorized the Naval Ordnance Laboratory to work directly with the Naval Proving Ground in the development and testing of warheads for guided missiles.

b. In an effort to provide controlled fragment warheads with a control method involving only a simple manufacturing operation, the Naval Ordnance Laboratory designed Warhead No. 142, which has coined narrow grooves. The grooves are similar to coined grooves used in industry to induce breaks in plate blanking operations.

4. OBJECT OF TEST:

This test was conducted to determine the ability of shallow coined grooves in a square grid pattern to control fragment size in a warhead model.

5. PERIOD OF TEST:

- | | |
|-------------------------------------|------------------|
| a. Date Project Letter | 18 November 1952 |
| b. Date Necessary Material Received | 19 November 1952 |
| c. Date Commenced Test | 11 December 1952 |
| d. Test Completed | 11 December 1952 |

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Fragmentation of Shallow-Grooved Warhead No. 142

PART C

DETAILS OF TEST

6. DESCRIPTION OF ITEM UNDER TEST:

Warhead No. 142, cylindrical, 4-1/8" outside diameter, 3/8" thick mild steel wall, 11-5/8" long, had grooves 1/16" deep in a 3/8" square grid pattern, Figure 1. The grooves were formed on a flat plate which was cold formed into a sleeve with the grooves on the inside. The warhead was loaded with Composition C-3 and the weights are as follows:

<u>Warhead No.</u>	<u>Empty Wt.</u>	<u>Comp. C-3 Wt.</u>	<u>Total Wt.</u>
142-1	14.59 lbs.	6.4' lbs.	21.00 lbs.

7. PROCEDURE:

The warhead was initiated with a 26 gram tetryl pellet and a special engineers' blasting cap at one end of the warhead. After detonation in a sawdust filled chamber, the sawdust was sifted and the fragments recovered by the use of sieves and a magnetic separator.

8. RESULTS AND DISCUSSION:

a. The shallow grooves, 1/16" deep in a 3/8" wall, were unsatisfactory in producing fragments of controlled size. The depth of groove, approximately 17% of the wall thickness, is considered to be too shallow for effective control. Reference (c) reported tests of notched ring warheads in which a groove depth of at least 25% of wall thickness was needed to offer fragment control and staggered notches were recommended over in-line notches for obtaining a greater number of control size fragments. Detailed mass fragmentation data of Warhead No. 142 is shown in Figure 2. Only 160 fragments, or 17% of the design number 930, were obtained in the design fragment weight group 5-10 grams.

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Fragmentation of Shallow-Grooved Warhead No. 142

PART D

CONCLUSIONS

9. CONCLUSIONS:

a. The grid-pattern shallow grooves of Warhead No. 142 were unsatisfactory in controlling fragment size.

b. It is believed that grooves having depths of greater than 50% of wall thickness are needed for controlling fragment size in a warhead of this design.

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Fragmentation of Shallow-Grooved Warhead No. 142

The tests upon which this report is based were conducted by:

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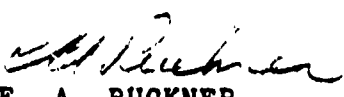
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